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09/753,087	01/02/2001	Edward B. Gindele	81807RLO	1337

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Patent Legal Staff
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EXAMINER

TUCKER, WESLEY J

ART UNIT	PAPER NUMBER
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2623

DATE MAILED: 01/20/2004

3

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/753,087

Applicant(s)

GINDELE ET AL.

Examiner

Wes Tucker

Art Unit

2623

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 January 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-41 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-41 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 January 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 1-4, and 10-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of U.S. Patent 5,509,086 to Edgar et al. and U.S. Patent 5,959,720 to Kwon et al.

With regard to claim 1, Edgar discloses a method of enhancing a single digital image affected by a noise source (abstract). The noise that the Edgar patent focuses on is color crosstalk.

Edgar discloses step a) receiving a source digital image affected by a noise source (abstract).

Edgar further discloses step b) using the pixels of the received source digital image to calculate a noise characteristic value that relates to the noise present in the received source digital image (column 7, lines 23-25). Here color cross talk is the noise to be eliminated and color cross correlation is the noise characteristic value.

Edgar further discloses step c) using the noise characteristic value and the received source digital image to respectively calculate an enhanced digital image for the received source digital image (column 12, lines 12-15). Here the color cross correlations are the noise characteristic values and are used to determine correction coefficients and the coefficients are applied to the original source image scans to calculate an enhanced image.

Art Unit: 2623

Edgar does not disclose receiving and enhancing more than one digital image from a plurality of digital images. Edgar does not disclose the unique feature of using more than one image. Kwon discloses using scanned information from multiple images to determine how to best enhance the multiple images (column 1, lines 53-60). Here a filmstrip is scanned and the multiple individual frames are used to calculate and modify color. It is well known in the art to use multiple images in collecting image data in order to obtain more information as an advantage over examining a single image. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to use multiple images as taught by Kwon in the method of noise extraction and correction of Edgar in order to obtain more information about the images and their noise characteristics and thus better enhance those images.

With regard to claim 2, Edgar discloses calculating the noise characteristic values as a function of the numerical values of the received source digital image pixels (column 8, lines 11-15). The color cross correlations are the noise characteristic values.

With regard to claim 3, Edgar discloses the source digital image to have pixels corresponding to different colors and step b) includes calculating the noise characteristic values as a function of the color of the received source digital image pixels (column 8, lines 11-15).

With regard to claim 4, Edgar discloses the source digital image to have pixels corresponding to different colors and step b) includes calculating the noise characteristic values as a function of the color and the numerical values of the received source digital image pixels (column 8, 11-15).

Art Unit: 2623

With regard to claim 10, Kwon discloses receiving the source digital images from a single image capture device including a digital camera, a photographic film scanner or print scanner (Fig.1, element 20). Kwon discloses using scanned information from multiple images from a filmstrip (column 1, lines 53-60).

With regard to claims 11 and 12, Kwon discloses the method wherein all of the received source digital images are derived from the same photographic film type (column 1, lines 53-60). Here it follows that if all of the images are taken from scanning a single filmstrip, that the images are derived from the same film type and the same consumer.

With regard to claim 13, the combination of Edgar and Kwon has already been applied to steps a) and b). With regard to step c), Edgar discloses storing the noise characteristic value with the received source digital images so that the noise characteristic value and the received source digital image can subsequently be used to generate one or more enhanced digital images (column 15, lines 10-16). Here the cross-correlation coefficients are used to populate a look-up table used to produce enhanced digital images. The received digital image would also be stored in memory since it was scanned and must be stored somewhere.

Claims 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of U.S. Patent 5,509,086 to Edgar et al. and U.S. Patent 5,959,720 to Kwon et al. as applied to claim 1 above, and further in view of U.S. Patent 5,923,775 to Snyder et al.

With regard to claim 5, Edgar and Kwon disclose the method of claim 1, but do not disclose the noise characteristic value as a function of the standard deviation of the noise present in the source digital images. Snyder discloses an apparatus and method for noise estimation and reduction in a digital image in which the noise characteristic is a function of the standard deviation of the noise present in the source digital image (column 2, lines 17-21). It is well known to use the standard deviation of a set of data as a threshold for inclusion. When measuring pixel values to determine if noise is present it is a common practice to use the standard deviation as a delimiting factor. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to calculate noise or any other outlying statistical value as a function of standard deviation in order to calculate a threshold for inclusion in a set of data.

With regard to claim 6, Edgar and Kwon disclose the method of claim 1. Edgar further discloses the method wherein step b) includes: using a residual spatial filter to calculate a residual digital image for each received source digital image (column 2, lines 35-40). Here the image is divided into different spectral or color bands. Edgar does not disclose using the pixel values of the residual digital images to generate a residual histogram and using the residual histogram to calculate the noise characteristic value. Snyder discloses separating the original image into several residual images and then calculating histograms for each of the residual images (column 2, lines 1-12). It is well known in the art to use histograms to measure and quantize data for better manipulation. A histogram is known to be especially helpful in plotting frequencies of occurring values in a data set such as a color distribution. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use histograms as taught by Snyder to plot data gathered by the method of Edgar and Kwon in order to better manipulate that data.

Art Unit: 2623

With regard to claim 7, Snyder discloses the use of histograms for code value separated images, meaning his residual images have been separated according to the code values of the individual pixels (column 2, lines 1-12). Snyder does not expressly say that the code values are related to color. Edgar discloses the separation of the image into specific color residual images. So it follows that the combination of Edgar and Snyder made in claim 6, includes the step of generating the residual histograms as a function of the color and the numerical values of the received source digital image pixels and calculating the corresponding noise characteristic values as a function of the color and the numerical values of the received source digital image pixels.

Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of U.S. Patent 5,509,086 to Edgar et al. and U.S. Patent 5,959,720 to Kwon et al. as applied to claim 1 above, and further in view of U.S. Patent 5,956,432 to Ohta.

With regard to claim 8, Edgar and Kwon disclose the method of claim 1. They do not disclose using an adaptive spatial filter responsive to the noise characteristic value to calculate the enhanced digital images. Ohta discloses using an adaptive spatial filter responsive to the noise characteristic value to calculate the enhanced digital image (column 4, lines 45-50 and Fig. 5, elements 501 and 502). Here Ohta discloses applying a spatial filter to sharpen the image and the sharpening is performed according to the correlation coefficient, which determined the noise characteristics of the image. It is well known to use filters to enhance digital images. Therefore it would have been obvious to one of ordinary skill in the art to use a filter to enhance the image according to the noise characteristic of Edgar as taught by Ohta.

With regard to claim 9, Ohta discloses a spatial sharpening filter used to reduce noise (column 4, lines 45-50 and Fig. 5, elements 501 and 502).

Claims 14-24 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of U.S. Patent 5,509,086 to Edgar et al. and U.S. Patent 5,959,720 to Kwon et al. and further in view of U.S. Patent 5,923,775 to Snyder.

With regard to claim 14, the combination of Edgar and Kwon has already been applied to step a) as discussed with regard to claim 1. With regard to step b), Edgar discloses receiving a source type identification tag corresponding to the received source digital images (column 15, lines 10-16 and 60-63). Here Edgar refers to using different models for different film types and in order to distinguish between types of film it is necessary to have some sort of tag or way to identify the film type or source type.

With regard to step c), Edgar discloses using the source type identification tag to select an appropriate default noise characteristic value from a plurality of stored default noise characteristic values (column 15, lines 10-16 and 60-63). Edgar discloses using the different models for different film types. The models would inherently make use of different noise characteristics for the different types of film and the different types of film would have to be identified by a tag of some sort.

With regard to step d) Edgar discloses calculating noise characteristics or color cross correlations locally. The noise characteristics are also compensated or weighted depending on the level of detail in an area of the image (column 2, lines 55-60).

With regard to step e) Edgar does not disclose combining the default noise characteristic with the local noise characteristic to calculate the updated noise characteristic. Snyder discloses calculating default noise characteristics (column 2, lines 19-22). The standard deviation is used as the initial default noise characteristic. Then neighborhoods of pixels are used to calculate local noise

Art Unit: 2623

characteristics (column 2, lines 23-26) and finally all of the noise estimates local and default, are combined to create an updated noise characteristic and noise reduced image. It is well known in the art that to achieve a more accurate calculation, it is necessary to perform estimations repeatedly. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to use the noise removal system of Edgar with noise estimation and calculation as taught by Snyder in order to better calculate an updated noise characteristic value.

With regard to claims 15-17, the discussions of claims 2-4 apply.

With regard to claims 18-20, the discussions of claims 5-7 apply.

With regard to claims 21-23, the discussions of claims 10-12 apply. Claims 10-12 do not discuss the use of identification tags, but such tags are inherent in determining the film type or image type.

With regard to claim 24, Snyder discloses using the updated noise characteristic value to enhance one or more of the received source digital images (column 2, lines 33-35).

With regard to claim 27, Snyder discloses calculating the updated noise characteristic from a linear combination of the local noise characteristic and the default noise characteristic value (column 5, lines 33-37). Here Snyder discloses the use of a linear operation for calculating additional signal noise estimates. It follows that the default noise characteristic and the local noise characteristic are combined linearly.

Claims 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of U.S. Patent 5,509,086 to Edgar et al. and U.S. Patent 5,959,720 to Kwon et al. and U.S. Patent 5,923,775 to Snyder as applied to claim 24 above and in further view of U.S. Patent 9,956,432 to Ohta.

Art Unit: 2623

With regard to claim 25, Edgar, Kwon, and Snyder disclose the method of claim 14. They do not disclose using an adaptive spatial filter responsive to the noise characteristic value to calculate the enhanced digital images. Ohta discloses using an adaptive spatial filter responsive to the noise characteristic value to calculate the enhanced digital image (column 4, lines 45-50 and Fig. 5, elements 501 and 502). Here Ohta discloses applying a spatial filter to sharpen the image and the sharpening is performed according to the correlation coefficient, which determined the noise characteristics of the image. It is well known to use filters to enhance digital images. Therefore it would have been obvious to one of ordinary skill in the art to use a filter to enhance the image according to the noise characteristic of Edgar as taught by Ohta.

With regard to claim 26, Ohta discloses a spatial sharpening filter used to reduce noise (column 4, lines 45-50 and Fig. 5, elements 501 and 502).

With regard to claim 28, the combination of Edgar, Kwon, and Snyder has already been applied to steps a) and b). With regard to step c) Snyder discloses the use of stored default residual histograms (column 3, lines 63-67). These gradient threshold histograms are already in place for use in calculating improved histograms once the residual local histograms are calculated. It follows that the tag identification used to choose between types of film as disclosed in Edgar (column 15, lines 10-16 and 60-63) would be used to select a histogram from multiple stored histograms.

With regard to step d) Snyder discloses using the pixels received source digital images to calculate a local residual histogram (column 3, lines 45-60 and Fig.2, elements 200-220).

With regard to step e) Snyder further discloses combining the selected default residual histogram and the local residual histogram to generate an updated residual histogram (column 4,

Art Unit: 2623

lines 10-14). Here the default gradient histograms are used to smooth the local residual histograms to create a plurality of updated smoothed histograms.

With regard to step f) Snyder discloses using the updated residual histogram to calculate the noise characteristic value (column 2, lines 1-12). Snyder calculates the noise characteristic value differently than Edgar since histograms are used. The histograms are used in determining thresholds, which effectively determine what is noise and what is not, so the thresholds are effectively noise characteristic values. It is well known in the art to use histograms to measure and quantize data for better manipulation. A histogram is known to be especially helpful in plotting frequencies of occurring values in a data set such as a color distribution. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use histograms as taught by Snyder to plot data gathered by the method of Edgar and Kwon in order to better manipulate that data.

With regard to claim 29, Snyder discloses the method wherein step d) includes calculating the local residual histograms as a function of the numerical values of the received source digital image pixels and wherein step f) includes calculating the noise characteristic values as a function of the numerical values of the received source digital image pixels from the corresponding updated residual histogram (column 2, lines 1-12). Here pixels are scanned and according to their code values they are split into residual images. Using the pixel values and the corresponding enhanced histograms the threshold noise characteristic values are calculated.

With regard to claim 30, Edgar discloses the method wherein the received source digital images have pixels corresponding to different colors. Snyder discloses the wherein step d) includes the step of calculating the local residual histograms as a function of the code value of the received

Art Unit: 2623

source digital image pixels and step f) includes calculating the noise characteristic values as a function of the code value of the received source digital image pixels from the corresponding updated residual histogram (column 2, lines 1-12). In the combination of Edgar and Snyder it would be obvious to use the histograms and code values for the pixels of Snyder to correspond to the color values of Edgar.

With regard to claim 31, the discussion of claim 30 applies. The histograms used by Snyder would have to be determined as a function of both color and numerical values as used by Edgar.

With regard to claim 32, the discussion of claim 5 applies.

With regard to claim 33, Edgar discloses the method wherein step b) includes: using a residual spatial filter to calculate a residual digital image for each received source digital image (column 2, lines 35-40). Here the image is divided into different spectral or color bands. Snyder discloses separating the original image into several residual images and then calculating histograms for each of the residual images (column 2, lines 1-12).

With regard to claim 34, Edgar discloses using the noise characteristic value to enhance the received digital image (column 3, lines 1-4). The noise characteristic is the color crosstalk and the goal is to remove that noise and thus enhance the image.

With regard to claim 37, Snyder discloses calculating the updated noise characteristic from a linear combination of the local noise characteristic and the default noise characteristic value (column 5, lines 33-37). Here Snyder discloses the use of a linear operation for calculating additional signal

Art Unit: 2623

noise estimates. It follows that the default noise characteristic and the local noise characteristic are combined linearly.

Claims 35 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of U.S. Patent 5,509,086 to Edgar et al. and U.S. Patent 5,959,720 to Kwon et al. and U.S. Patent 5,923,775 to Snyder as applied to claims 28-34 above and in further view of U.S. Patent 9,956,432 to Ohta.

With regard to claim 36, Edgar, Kwon, and Snyder disclose the method of claim 28. They do not disclose using an adaptive spatial filter responsive to the noise characteristic value to enhance one or more of the received source digital images. Ohta discloses using an adaptive spatial filter responsive to the noise characteristic value to enhance a digital image (column 4, lines 45-50 and Fig. 5, elements 501 and 502). Here Ohta discloses applying a spatial filter to sharpen the image and the sharpening is performed according to the correlation coefficient, which determined the noise characteristics of the image. It is well known to use filters to enhance digital images. Therefore it would have been obvious to one of ordinary skill in the art to use a filter to enhance the image according to the noise characteristic of Edgar as taught by Ohta.

With regard to claim 36, Ohta discloses a spatial sharpening filter used to reduce noise (column 4, lines 45-50 and Fig. 5, elements 501 and 502).

With regard to claims 38-41, Kwon, Edgar, and Snyder all disclose computer-based methods, which inherently contain a storage medium and instructions for performing the functions of the invention.


Art Unit: 2623

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wes Tucker whose telephone number is 703-305-6700. The examiner can normally be reached on 9AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703) 308-6604. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

Wes Tucker
1-2-04


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